

Application No. 10/708,020
Technology Center 1775
Amendment dated June 5, 2006
Reply to Office Action dated January 4, 2006

REMARKS

In the Office Action, the Examiner reviewed claims 1-20 of the above-identified US Patent Application, with the result that claims 1-20 were rejected under 35 USC §103. In response, Applicants have amended the claims as set forth above. More particularly:

Independent claims 1 and 17 have been amended to specify that the second ceramic layer (22) is noncolumnar, the outermost layer of the thermal barrier coating system (14), and formed by a fully stabilized zirconia that is less erosion resistant than the partially stabilized zirconia of the first ceramic layer (20), yet the second ceramic layer (22) is more erosion resistant than the first ceramic layer (20) as a result of having vertical microcracks (24). Support for these amendments can be found in Applicants' specification at paragraphs [0009] and [0019] (relative erosion resistance; second ceramic layer (22) as the outermost layer), paragraph [0014] (second ceramic layer (22) is noncolumnar), and Figure 1.

Applicants believe that the above amendments do not present new matter. Favorable reconsideration and allowance of claims 1-20 are respectfully requested in view of the above amendments and the following remarks.

Application No. 10/708,020
Technology Center 1775
Amendment dated June 5, 2006
Reply to Office Action dated January 4, 2006

Rejections under 35 USC §103

Independent claims 1 and 17 and their dependent claims 2-16 and 18-20 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,887,595 to Darolia et al. (Darolia) in view of U.S. Patent No. 6,716,539 to Subramanian, and as being unpatentable over U.S. Patent No. 6,764,779 to Lui et al. (Lui) in view of Subramanian. Applicants respectfully request reconsideration in view of the claims as amended and the following comments.

Applicants teach and claim a thermal barrier coating (TBC) system 14 comprising a first ceramic layer 20 and an outermost second ceramic layer 22 that overlies the first ceramic layer 20. Both ceramic layers 20 and 22 are deposited by a thermal spray process, with the result that the ceramic layers 20 and 22 have a particular type of grain structure (see paragraph [0005] of Applicants' specification). In particular, the second ceramic layer 22 is recited in the claims as being noncolumnar. Furthermore, both ceramic layers 20 and 22 are formed of zirconia-based materials, in which the first ceramic layer 20 is partially stabilized zirconia while the second ceramic layer 22 is fully stabilized zirconia. The zirconia stabilization of the ceramic layers 20 and 22 is such that the fully stabilized zirconia of the second ceramic layer 22 is less erosion resistant than the partially stabilized zirconia of the first ceramic layer 20.

Application No. 10/708,020
Technology Center 1775
Amendment dated June 5, 2006
Reply to Office Action dated January 4, 2006

Nonetheless, the second ceramic layer 22 has vertical microcracks 24 that render the second ceramic layer 22 more erosion resistant than the first ceramic layer 20.

In contrast, though Darolia teaches a TBC system 22 with a partially-stabilized inner zirconia layer 26 and a fully-stabilized outer zirconia layer 30, Darolia's zirconia layers 26 and 30 are required to contain a variety of stabilizers that inherently affect erosion resistance, and Darolia does not teach anything regarding the relative erosion resistance of the layers 26 and 30. Furthermore, Darolia does not teach or suggest forming the outer zirconia layer 30 to have vertical microcracks.

Similar to Darolia, though Lui teaches a TBC system 30 with partially-stabilized zirconia layers 50 and fully-stabilized zirconia layers 60, Lui does not teach anything regarding the relative erosion resistance of the layers 50 and 60. In further contrast to Applicants' claimed TBC system 14, Lui teaches that a partially-stabilized zirconia layer 50 defines the outermost layer of the TBC system 30 in order to promote erosion resistance (column 2, lines 31-36). Finally, Lui does not teach or suggest forming the outer zirconia layer 50 to have vertical microcracks.

While Subramanian was cited as disclosing a ceramic layer 22 with "vertical microcracks," the cited features are gaps 26 and not "vertical

Application No. 10/708,020
Technology Center 1775
Amendment dated June 5, 2006
Reply to Office Action dated January 4, 2006

microcracks" as this term is defined in Applicants' specification at paragraph [0005]. In fact, Subramanian expressly teaches that the ceramic layer 22 is columnar (column 2, lines 63-64), contrary to Applicants' claimed noncolumnar ceramic layer 22. Furthermore, at column 2, lines 21-31, Subramanian teaches away from vertical microcracks of the type claimed by Applicants.

In view of the above, Applicants believe that Subramanian cannot be said to supplement the teachings of either Darolia or Lui in order to arrive at Applicants' invention, because none of these references teaches or suggests that an outer ceramic layer 22 formed of a material that is less erosion resistant than the material forming an inner ceramic layer 20 can be rendered more erosion resistant than the inner ceramic layer 20 by forming the outer ceramic layer 22 to have vertical microcracks 24. Furthermore, Applicants believe that one skilled in the art would not and could not rely on the teachings of Subramanian to modify Darolia or Lui in order to arrive at Applicants' invention, since Subramanian specifically teaches away from the use of vertical microcracks, and instead teaches an outermost layer 22 with a columnar grain structure. Applicants therefore respectfully request withdrawal of the §103 rejections to the claims.


Application No. 10/708,020
Technology Center 1775
Amendment dated June 5, 2006
Reply to Office Action dated January 4, 2006

Closing

In view of the above, Applicants believe that the claims define patentable novelty over all the references, alone or in combination, of record. It is therefore respectfully requested that this patent application be given favorable reconsideration.

Should the Examiner have any questions with respect to any matter now of record, Applicants' representative may be reached at (219) 462-4999.

Respectfully submitted,

By 
Domenica N.S. Hartman
Reg. No. 32,701

June 5, 2006
Hartman & Hartman, P.C.
Valparaiso, Indiana 46383
TEL: (219) 462-4999
FAX: (219) 464-1166

Attachment: Fee Transmittal form